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Develop New Hog Watering System

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DEVELOP NEW HOG WATERING SYSTEM

Agricultural engineers at Iowa State College have developed a continuously circulating hog watering system. It eliminates the need for individual heating units in the waterers to prevent winter freeze-ups.

by T. E. Hazen and N. H. Curry

A NEW hog watering system has been developed by agricultural engineers at Iowa State College. It's a continuously circulating system which provides water of virtually uniform temperature and largely eliminates the danger of freezing and the need for heaters in individual waterers.

The principle involved is the use of "warmth" of the ground below the frostline through continuous circulation of water through the system. Water maintained at approximately below-frostline temperatures is continuously circulated through an underground pipe system and through cores in individual waterers. Level of the water in the drinking reservoirs of the individual waterers is controlled by float valves.

The system was developed as a part of a study of the effects of temperature and other environmental factors on the growth and feed efficiency of swine. It was necessary to provide an ice-free supply of water at relatively uniform temperature to different locations and lots of pigs.

To do this, agricultural engineers decided to design and test a unit which obtained its heat from soil below the frostline and kept the water continuously above freezing. It seemed possible that, by circulating water through an underground network of pipes, sufficient heat could be obtained to prevent freezing.

The systems which have since been installed at Iowa State College and the Iowa Swine Producers' Boar Testing Station near Ames have worked quite well, though continual improvements are being made. Similar installations are now being made in several Iowa counties as well as at swine testing stations in several other states.

How It Works . . .

The Basic System is shown in *black* on the next page. The starting point is the central supply tank or reservoir located in an enclosed pit. Water is supplied to this reservoir either from a well or from an existing farm pressure water system. The level of the water in the reservoir is controlled by a float valve.

Water is pumped from the reservoir by a continuously operating pressure pump into the pipe network. Except for risers to the individual watering units, the water travels below the frostline—maintaining water temperature above freezing.

Through the risers, however, water is pressure-forced into cores cast into the individual watering units. Water flows into the drinking reservoirs of the watering units only as needed and as controlled by the float valve in each. Otherwise, the continuous flow circulates only through the cores cast into each unit and then back underground. The mere circulation of the water through the cores—and then back underground to pick up heat from below the frostline before moving on to the next waterer—has been sufficient to prevent the water in the drinking reservoirs from freezing.

After traveling through the underground pipe network and through the cores of each watering unit, the water returns to the central supply tank or reservoir. And, basically, the same water circulates again and again through the system without waste.

As pigs drink water, of course, the float valves in the watering units permit replacement water to enter the drinking reservoirs from the circulation cores. This, in turn, means that additional fresh water will enter the central supply tank or reservoir as permitted by the tank float valve to replace the amount used by the pigs.

This, then, is the basic system. Although simplifications might appear attractive, they cannot be recommended. Elimination of the central reservoir and circulating pump, for example, would be pos-

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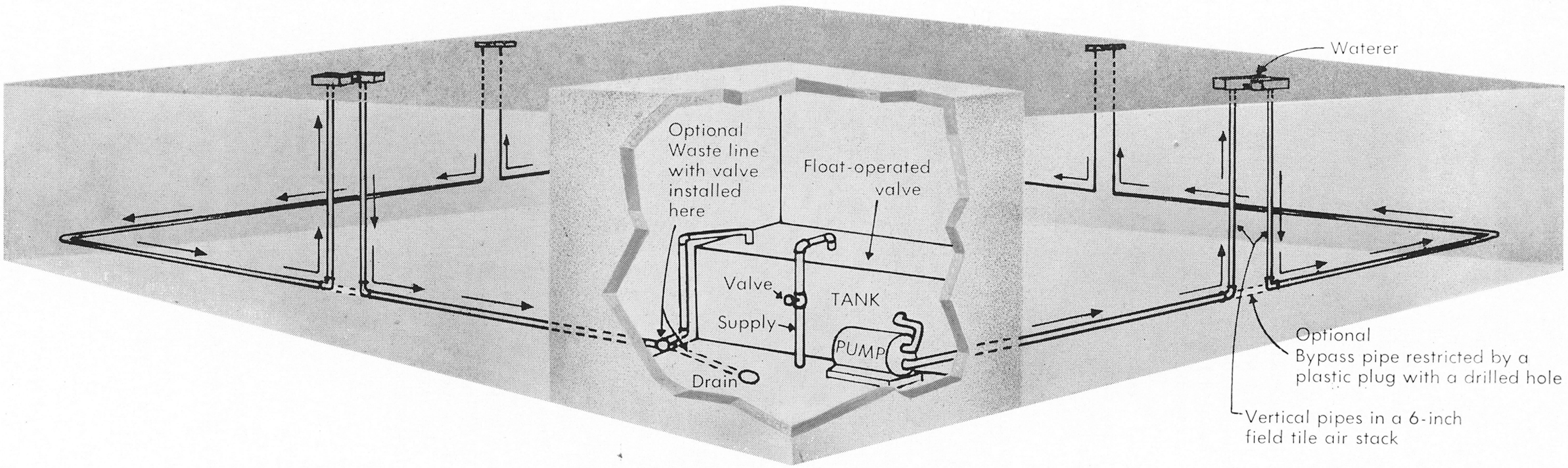
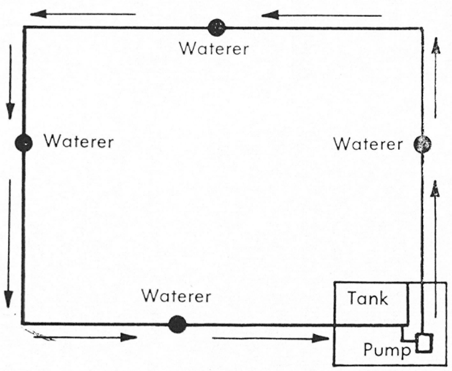
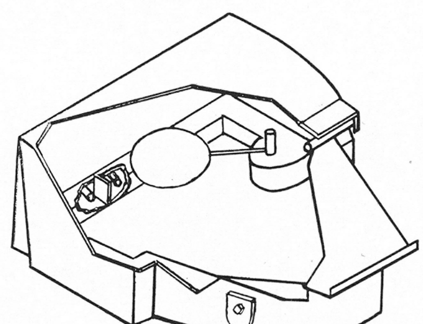
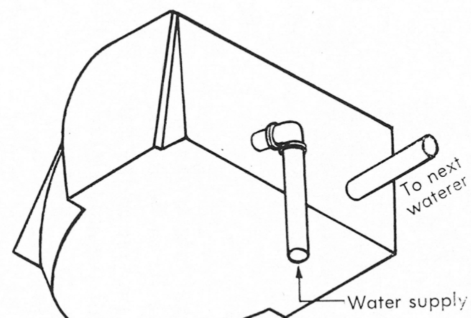




Top view
of system



Top view of
individual waterer



Bottom view of
individual waterer

sible by simply connecting your existing pressure water system to the underground pipe network. For continuous circulation, however, one end of the system would have to be left open with considerable water wastage. And there'd also be the danger of water in the hog-watering system back-syphoning into the main farm water system.

Modifications . . .

There are several slight modifications which may be made in the "basic system" to provide additional "insurance" against possible freeze. Two eventualities to consider are (1) a power failure which would interrupt operation of the circulating pump and (2) relatively rare instances of extremely cold weather. We've overcome these successfully through two modifications.

Power Failure: We've seen in the "basic system" the need for continuous circulation to prevent freezing in cold weather. What happens when there's a power failure during cold weather so that the pump cannot circulate the water?

The system is still full of water—the underground pipes, the risers, the cores in the waterers and the drinking reservoirs in the waterers. But the water, instead of moving and circulating, comes to a standstill. Therefore, water in the drinking reservoirs, in the cores and in the risers above the frostline might freeze.

We solved this problem by installing bypass pipes (shown as dashes) between the risers to individual watering units. We restricted the bypass pipes with plastic plugs with holes in them large enough to carry only one-third of the flow or capacity of the unrestricted pipes of the basic system. So while one-third of the circulating water moves through the bypass pipes, two-thirds still moves through the risers and individual waterers.

In case of a power failure and lack of circulation and pressure, however, the restricted bypass pipes permit water above them (in the risers, cores and watering reservoirs) to drain back by gravity to the central supply tank or reservoir. This means that water returning to the central reservoir will overflow into the drain and be "wasted." But all exposed parts of the system will have already been drained of water and no longer be in danger of freeze damage. Restoration of power will start the pressure circulating pump, fill the system with water again and continue the circulation of water through the system.

Extreme Cold: Upon rare occasions in extremely cold weather—and especially where watering units are numerous and the underground runs are short—heat obtained from soil below the frostline may not be enough to prevent freezing. In this case, even the central reservoir might be subject to freeze damage. We developed another modification, however, to meet this situation.

We installed a solenoid-operated valve at a point just before the pipe network re-enters the central reservoir after circulating water through the system. This valve is controlled by a temperature-operated thermostat in the central reservoir. When the reservoir water temperature drops below the thermostat setting, the valve opens—permitting some water to escape from the system to the drain. This allows fresh, warm water from the well or farm pressure water system to enter the reservoir as necessary to keep the water in the system above freezing.

Normally, this would occur only during extremely cold nights. The pigs usually would drink enough water during the day to allow sufficient fresh water to enter the central reservoir. The valve would, however, operate during an extremely cold day if the water in the system dropped below the preset thermostat setting.

Other Features . . .

For simplicity in explaining the basic system and the two possible modifications, several features have been omitted from the drawing and descriptions.

Omitted from the drawing, for example, is the showing of 6-inch tile around the risers to the individual watering units. We installed 6-inch tile around the risers to surround them with an insulating column of air as they passed up through the frostline to the waterers. This provides an additional protective anti-freezing feature for the system.

Dimensions also have been omitted from the drawing. The most critical dimension is that of depth. The underground pipe network, for example, should be placed at least 6 feet deep—well below the frostline. And, in the system and modifications described, the central reservoir and pump are in a pit below the level of the waterers and extending down below the frostline. We have, on the other hand, developed somewhat more complicated methods by which the supply tank may be located above the waterers.

To reduce costs, we used watering units without an insulating jacket—placing them on concrete slabs, with a 2-inch creosoted plank to provide insulation between the waterer and the concrete.

One other feature of the system is the provision of relatively cool water for pigs in the summer. That is, the underground pipe network which operates as a "heating" system in the winter (when the soil temperature below the frostline is warmer than the outdoors) is, in effect, a "cooling" system during the summer months when the temperature situation is reversed.

All in All . . .

This watering system is an outgrowth of a necessary development in certain hog production experiments. It has worked well, however, and appears to have practical on-farm application, depending on individual farm situation, number of hogs, etc. Costs would vary considerably, depending on both size and extensiveness of the system.

The purpose of this article is to report the development and successful use of a continuously circulating hog watering system. Such a system should be carefully designed according to specific farm needs and situations. This would be essential to assure a correct amount of water circulation, with lines properly placed and sized. Otherwise, such a system might not operate satisfactorily under the particular temperature conditions which may be encountered.